WHAT IS CLAIMED IS:

1. A polymer nanocomposite, comprising:

60~99 wt % of high molecular substrate;

0.5~30 wt% of layer structured inorganic, well dispersed, coated evenly on the high molecular substrate; and

0.5~30 wt % of polyelectrolyte, which carries the opposite charge of the layer-structured inorganic material and it is attached onto the layer-structured inorganic material.

2. The polymer nanocomposite as claimed in claim 1, wherein the high molecular substrate is selected from the group consisting of styrene-butadiene rubber, isopiperylene rubber, butadiene rubber, acrylonitrile-butadiene rubber, natural rubber, PVC, PS, PMMA, PU and combinations thereof.

3. The polymer nanocomposite as claimed in claim 2, wherein the original state of the high molecular substrate is latex.

4. The polymer nanocomposite as claimed in claim 3, wherein the latex is styrene-butadiene rubber latex and PMMA latex.

5. The polymer nanocomposite as claimed in claim 1, wherein the layer-structured inorganic material is selected from clay, and its cationic ion exchange equivalent is between 30 and 200 meq/100g.

6. The polymer nanocomposite as claimed in claim 5, wherein the layer-structured inorganic material is selected from the group consisting of smectite clay, vermiculite, halloysite, sericite

and fluoro-mica.

7. The polymer nanocomposite as claimed in claim 6, wherein the smectite clay is selected from the group consisting of montmorillonite, saponite, beidellite, nontronite, hectorite and stevensite.

8. The polymer nanocomposite as claimed in claim 1, wherein the polyelectrolyte is cationic polyelectrolyte.

9. The polymer nanocomposite as claimed in claim 8, wherein the cationic polyelectrolyte is selected from the group consisting of poly(diallyl dimethylammonium chloride), poly (4-vinyl pyridine) and combinations thereof.

10. The polymer nanocomposite as claimed in claim 9, wherein the total charge mole number of the polyelectrolyte is 1 to 10 times that of the layer-structured inorganic material.

11. A method of preparing a polymer nanocomposite, comprising the steps of:

(a). combining a layer structured inorganic solution with a polyelectrolyte solution to obtain a mixture solution, the polyelectrolyte has opposite and over amount of charges with respect to the layer-structured inorganic material, which the polyelectrolyte is attached on the layer-structured inorganic material; and

(b). combining the obtained mixture solution with a polymer latex, the polymer latex carries opposite charges with respect to the polyelectrolyte, by way of co-agglutination, a layer-

structured inorganic/polyelectrolyte/polymer nanocomposite is obtained.

12. The method as claimed in claim 11, wherein the solution includes organic solvents.

13. The method as claimed in claim 11, wherein the polymer latex is selected from the group consisting of styrene-butadiene rubber, isopiperylene rubber, butadiene rubber, acrylonitrile-butadiene rubber, natural rubber, PVC, PS, PMMA, PU and combinations thereof.

14. The method as claimed in claim 13, wherein the polymer latex is styrene-butadiene rubber latex and PMMA latex.

15. The method as claimed in claim 11, wherein the layer-structured inorganic material is selected from clay, and its cationic ion exchange equivalent is between 30 and 200 meq/100g.

16. The method as claimed in claim 15, wherein the layer-structured inorganic material is selected from the group consisting of smectite clay, vermiculite, halloysite, sericite and fluoro-mida.

17. The method as claimed in claim 16, wherein the smectite clay is selected from the group consisting of montmorillonite, saponite, beidellite, nontronite, hectorite and stevensite.

18. The method as claimed in claim 11, wherein the polyelectrolyte is cationic polyelectrolyte.

19. The method as claimed in claim 18, wherein the cationic polyelectrolyte is selected from the group consisting of poly(diallyl dimethylammonium chloride), poly (4-vinyl pyridine) and combinations thereof.

20. The method as claimed in claim 9, wherein the total charge mole number of the polyelectrolyte is 1 to 10 times that of the layer-structured inorganic material.